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ABSTRACT

A study examined two writers and their use of word processing and pen and paper in order to set up and draw out the important variables that influence writers' decisions about word processing. Subjects, a college freshman and an engineer, were interviewed about their writing processes and were observed in their natural environment. Results indicated that these writers chose word processing for many reasons, including neatness and efficiency, the convenience of making changes, and the formatting options available. Results also indicated that factors that led them not to use word processing included needing to see more information than was available on the screen, finding the computer "cold" or "distracting", and lack of convenient access to machines. Findings suggest that the choice to use or not to use word processing is made again and again as new writing tasks are undertaken. (Twenty-seven references are attached.) (RS)

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Word Processing as Decision-making:

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One of the most fruitful notions to come out of current research in writing is that writing is not something that happens to us, but a purposeful act over which we exert some control. The work of process researchers such as Hayes and Flower (1980), Bereiter and Scardamalia (1982, 1987a, 1987b), and Matsuhashi (1981, 1987) have made this notion explicit in their work. Although pursuing different questions and often using different methods, process researchers have drawn expressly on the work of cognitive psychologists such as Allan Newell and Herbert Simon (1972) and George Miller and his colleagues (1960, 1967) to make the case that writers set goals and make plans for their writing. Writing, like many other cognitive acts, involves the setting of goals and the adopting of plans to meet those goals. These complex, inter-related networks of goals and plans reflect countless choices--choices which range from intended audience effects to word choice (Flower & Hayes, 1981).

Some date the beginning of process research in writing with Janet Emig's 1971 research. Her work is perceived as making a strong break with a previous research tradition in which the nature of writing and writing improvement was seen to rest not with the writer's choices and decisions, but with methods of instruction or classroom practices (Faigley et al. 1986; Hillocks,

1986). Emig's methods also provided a sharp shift from the previous pre-test/post-test methodology of "first generation researchers" (Faigley, 1986) to a case study approach which focused on the strategies and decisions of writers. Emig detailed the writing behavior of "Lynn," emphasizing not the written products the student produced but the process by which she produced them. Emig's descriptive case study made explicit the decisions and choices that Lynn made while producing a variety of texts.

While process researchers have been explicit about the decision-making nature of writing, researchers exploring the social contexts of writing have also noted the choices writers make--and they see those decisions as often driven by the expectations of others (Freedman & Katz, 1987; Heath & Branscombe, 1985), by their desires to become part of--or remain separate from--a community (Bartholomae, 1985), and by countless other factors which make up the discourse contexts in which people live and work. In one of her many critiques of Hayes and Flower's work, Patricia Bizzell (1987) acknowledges the importance of goals and plans for writing, although she claims that writers' decisions cannot be seen outside the discourse communities to and for which they write. While research into writing by process researchers and social researchers may differ in method and in focus, most current research places strong emphasis on the decision-making nature of writing.

Another choice that many writers today must make is to use, or not to use, word processing. A variety of potential benefits of computer-assisted composition have been set forth, among them increased individual instruction, relieved writer's block, enhanced creativity, an awareness of the social aspects of writing, and an increase in revision (Daiute, 1985; Feldman and Norman, 1987; Wresch, 1984). However, the operative word here is potential: certainly these benefits will not accrue if people do not choose to use the new technology.

While we often acknowledge the hard choices that *educators* will have to make about computers in the writing classroom (Holdstein, 1987), we may have overlooked the choices that *writers themselves* make, or the factors that influence those choices. We may think of the decision to

use word processing, if we think of it at all, in a number of ways:

> as a single decision made once--as if once writers "get up the nerve" to use the technology, there's no turning back
>
> as a decision based on youth, fearlessness, and experience with technology in general--as if kids who grew up on video games and have had their own computer since junior high will take naturally to word processing technology
>
> as a decision is based on habit--as if people continue to use pen and paper because that is what they are used to, or
>
> as one of availability--as if people have machines available, they will use them.

While each of these assumptions may have some truth to it, even together they probably do not fully explain why people choose to use or choose not to use word processing.

Two points need to be made about the decision to use word processing in writing:

(1) The factors influencing the decision to use word processing are many and varied, including not only availability and experience, but also more complex factors, like writers' own purposes, the limitation of machines to meet those purposes, and the characteristics of the writing task at hand.

(2) The decision to use word processing is not one decision, but an ongoing series of decisions. Choices to use, or not use, a computer for writing may be made again and again, as goals and contexts change. We can imagine that writers might use a word processor for some tasks but not for others; or they may write with a computer at work, but not at home. Writers may even use a computer for some parts of writing--making word- and sentence-level changes--but rely on pen and paper for other subtasks, such as making notes or an outline.

A previous study, reported in Haas and Hayes (1987), described a group of experienced

computer writers' use of pen and paper and of word processing. We observed how these writers moved back and forth between technologies--machine and pen--as they wrote. There were consistencies across subjects in the patterns of this movement between technologies that suggested that it was not random, but purposeful. We found that even for the most adamant of computer writers, writing with the machine seems to be a complex weaving together of different writing media or technologies.

Related Prior Research

Observational Studies

Two important case study research projects conducted by Lillian Bridwell and her colleagues point out some of the ways that writers used pen and paper while word processing. Bridwell, Johnson, and Brehe (1987) conducted case studies of eight experienced (published) writers. The writing behavior of each writer was studied--via interviews and observations--in one "scribal" session and three word processing sessions. Although Bridwell et al. said there were important individual differences across subjects in composing styles, most of the writers reported some limitations of word processing and they often supplemented their word processing with pen and paper. The limitations described by these writers and their uses of pen and paper during word processing varied. For instance, "Didi" felt that the word processor drew her into low-level editing before it was appropriate and that she often felt "a distance" from her text because it was on the screen. Another writer, "Lance," reported feeling a pressure to produce with word processing, and that he missed the "sitting and staring" and the doodling on a yellow pad that usually accompanies his pen and paper writing. Other writers reported using paper to make notes and tree diagrams both before and during writing, and using typed print-outs of their text to judge or perfect them.

A second series of case studies, this time with student writers, were conducted by Bridwell, Sirc, and Brooke (1985). These researchers surveyed 48 students about their use of word

processing and then selected five students to study further via interviews and analysis of the students' texts. The survey revealed that while 48% of the students used the computer for "composing start to finish," over 51% used it for editing, revising, or preparing a final manuscript only. Although the students' interviews are reported in less detail than those of the experienced writers in the previous study, Bridwell et al., suspected that student writers were "lured to produce polished texts too quickly" when using word processing.

Other observational studies have also pointed out how writers continue to use pen and paper while word processing to counter some of the limitations of the newer technology. Case (1985) conducted a survey of 60 university faculty to assess how word processing had changed their writing habits. Among the drawbacks of word processing that these writers reported was a temptation to begin writing "too soon," a tendency to "fool around" with the text too much and revise endlessly, and a dissatisfaction with the word processor for initial composition of text. The college-age basic writers studied by Nichols (1986) also reported various dissatisfactions with word processing, and Nichols concluded that in using word processing these basic writing students may have increased their attention to surface features.

While the subjects studied by Bridwell et al. Case, and Nichols had had only hours or a few days experience with word processing, the writers John R. Hayes and I (Haas & Hayes, 1986) interviewed had computer experience ranging from 3 months to 18 years. These writers voiced concerns similar to those reported above about the constraints and word processing and the uses of pen and paper with word processing.

Experimental Studies

A few experimental studies have been conducted which compare word processing to pen and paper. Most of these studies have focused on revision, based on the intuition that the ease of making changes with word processing will increase revision. These studies have applied textual analysis measures to writing and revisions done with word processing and with pen and paper.

Taken together, the results of these studies seem inconclusive.

An early pilot study by Collier (1983) compared the "traditional" revising of four college students to their revising on a word processor. In a first session, the subjects wrote out a first draft longhand, and then revised it with word processing in a second session several days later. Between the two sessions the students' drafts were typed into the computer by a member of the research team. Given the small sample size, statistically conclusive and reliable results were not obtained. However, Collier's work does provide some interesting trends which could be examined through future research. With word processing, it appeared that the length of the essays increased slightly, the number of revision operations increased slightly, and manipulations of text at the word-, phrase-, and clause-level increased. However, more substantial additions were made by hand, and the "traditional" pen and paper method was superior for revisions at the "idea cluster" and paragraph level. Again, these trends were not significant, however.

A study by Daiute (1986) compared the revisions made on-line and on paper by a group of 57 seventh- and ninth-graders. Daiute found that students made significantly fewer revisions and fewer additions when using word processing, and that additions in the word processing condition seemed to occur at the end of the text rather than in the body of the text. On the other hand, the students made fewer errors and corrected more errors when using word processing. They produced longer drafts with pen and paper, but the revised final essays produced with word processing were longer. Students had had one month experience with the word processing program before the study began, and although Daiute said each student used the word processor "fairly frequently compared to more typical classrooms," it was in fact only one class period per week per student. Unfortunately, Daiute did not counter-balance for topic or for order of the conditions; all the students wrote on word processing on the same topic at the same time, and the same was true for the pen and paper condition. Therefore, the results may have been due to topic or order rather than the medium that the writers were using for revision. Given the

problems with this study--very little subject experience with word processing and a possible confounding of topic and order with condition--Daiute's results are not conclusive.

Hawisher (1987) carried out what may be the most complete study of the effects of word processing on revising to date. She studied 20 advanced freshmen who wrote four essays, two with word processing and two with pen and paper, over the course of a semester. Subjects had five and one half weeks experience with word processing before the study began, and each subject had access to a machine during class time. The conditions were counter-balanced. Hawisher coded the resulting essays based on Faigley and Witte's (1981) revision framework and analyzed the following: number of revisions, kind of revisions, relationship between revision and judged quality, and relationship of writing tool and judged quality. The results were mixed: there were significantly more revisions with pen and paper, but differences in surface and meaning revisions were not significant. There were no significant differences in the judged quality of the essays, nor was there a significant correlation between amount of revision and quality.

The question asked by most of these experimental studies is "Is word processing better than pen and paper for revision?" These studies have sought to determine which tool is "better," and the mixed results leave the question unanswered. Given that questions about how people use of word processing are recent ones, it seems appropriate to employ methodologies that give us a rich picture of how writers interact with writing media. Rather than ask "which tool is better?" a more fruitful way, perhaps, to explore the effects of word processing on writing is to analyze how writers actually use both tools and explore the effects of using the tools in particular ways.

Those studies of word processing which have been described adequately have varied widely both in the variables studied and the contexts in which the study was conducted. Describing the decision-making of writers using pen and paper and word processing is a reasonable way to begin to learn more about how writers can and do use these two writing technologies. In the

section which follows, I describe two writers and their use of word processing and of pen and paper. I will use these two cases to set up and draw out some of the important variables that seem to influence writers' decisions about word processing.

Two Writers' Decisions about Word Processing

These two writers--Tim and Johnny--are in some ways very different: Tim is a college freshman, Johnny is an ambitious engineer; Tim feels writing is "OK"; Johnny sees it as one of the most important--and rewarding--things he does. But their decisions to use pen and paper or word processing, while reflecting their differences as writers, also reveal some common patterns. This section describes these writers and their decisions to use the writing tools and technologies at their disposal.

Tim

Tim is a freshman at Carnegie Mellon University. He is from a small city in Pennsylvania and he is leaning toward majors in Management and Psychology. Tim is friendly, outgoing, even a bit flamboyant. Tim is not a particularly serious student, but he is a bright--had about a B+ average in High School and he placed out of the regular freshman writing course.

As a writer, Tim is probably close to average for a college freshman. He likes writing "OK." He says good-naturedly, "It's not the worst thing in my life." He did a fair amount of writing in high school; for instance, during his last semester his Senior year he did two research papers (one in Sociology and one in Economics) and several book reports and a term project of his choosing in English. Tim chose to do a short story. He prefers, he says, writing about his own feelings rather than being objective, although he also likes writing which involves supporting ideas logically--"if I'm into what I'm writing about."

At least for the school writing tasks we talked about and I observed him performing, Tim seems to be a "start to finish in one sitting" writer. Although he sometimes mentioned revision, I saw

little evidence that he did much substantive revision. Tim acknowledges that he procrastinates, but says he is usually satisfied with his writing after a couple of revisions--which to him often meant fixing errors.

Tim has had his own computer since he was 13. He used it (when he lived at home) for playing games, for writing, and for two years of programming that he took in high school. He likes computers. He says, "I get into playing with them--throwing the manual away, and just seeing what I can figure out on my own." That's one reason he finds the computer in the classroom distracting: "I just want to play with it, not do whatever the class is doing."

Tim uses a computer for writing because it is easy and quick and saves him time. He believes that computers are particularly useful for good typists who can "really save lots of time by writing and typing together." The formatting capabilities of word processing are also important to him: he likes using different fonts and keeping things neat. He also uses word processing because he can "revise right away" and "move stuff around real easy." He likes to use computer for writing particularly "when words are just flowing out of me," or when (like book report in high school), the form is given and "you can just write it out real easily on the computer." Of course, another factor which may influence Tim's use of the computer for writing is that it is strongly encouraged by his writing teacher.

However, in the course of producing several specific texts over the course of a semester, Tim also makes several decisions not to use computer for writing. Interestingly, availability and access problems don't impact on Tim too much . Once when he couldn't get to a machine in a public cluster, he just decided not to do his draft. Other than that, he seemed to be able to get to a computer when he needed one. (Tim decided not to bring his own computer to school--since he figured there would be plenty of machines, and they are, in his opinion, better machines than his own.)

Sometimes Tim's decision not to use word processing to produce his texts runs counter to his

teacher's wishes. Tim knows of his teacher's enthusiasm for word processing: " well, he's [the teacher is] real gung-ho on Andrew [the computing system at Carnegie Mellon.] He wants everything done there. He's hoping eventually the whole class will be Andrew-oriented," but Tim often uses pen and paper anyway.

In describing his writing, Tim makes a distinction between the short story he wrote in high school, which he did completely on the computer "because my feelings would just come flowing out," and research papers, which are "harder" and have to be "objective." For this reason, he says, he wrote his research papers in high school out on paper and "let my Mom type it."

Tim thinks that using paper for drafting makes a text "better": "If I get the structure on paper first my ideas come out better." He also feels more comfortable using paper, "getting my hands on it" to "follow and check the order." Sometimes the computer is "cold", he says; other times it's too fun and distracting to use for writing, particularly in-class writing.

Despite Tim's experience with computers and his own and his teacher's enthusiasm, there are times when he chooses to use pen and paper rather than the computer for writing. His decision may be influenced by the writing task he's performing, by his own purposes for writing, and by his perception of how well the computer can help him achieve those purposes.

Johnny

The second writer, Johnny, is a Systems Designer for a research lab of a major computer corporation, and a part-time graduate student. He has a BS degree in Electrical and Computer Engineering and is judged by his superiors and peers to be a better-than-average to exceptional writer. Both his job and his graduate work require extensive writing and he is currently producing an academic article with a professor of Computer Science. Johnny is 25 years old. He has been using computers--for writing and for programming--for seven years; he has one machine at home and three (generally) in his office. Johnny is also a sax player in a jazz band, a marathon runner, and an avid baseball fan. In sum, Johnny is an exceptionally bright and

ambitious young man who is already very successful, due in part to his excellent communication skills.

Johnny spends most of every day at a computer terminal or PC. When asked why he uses a computer to write, he first seems a bit surprised that the question would be asked at all, then rattles off a list of advantages: quicker changes, not wasteful, more efficient, more flexible, easier to keep track of one's documents. But, like Tim, there were times when Johnny chose **not** to use a computer for his writing, but chose instead to use pen and paper.

With three computers in his office, access to machines is not usually a problem for Johnny; he did mention, however, that he first began using a PC to write when these computers became readily available to him. Sometimes Johnny uses pen and paper--or hard copy printouts--because a computer won't allow him do what he wants to do. For instance, even the large screen display workstation that he has in his office often doesn't display enough text. When he writes text, or writes computer programs, he prefers to use hard copy printouts to read:

> I use printouts quite frequently--just to read over. I make a copy of it after a few pages and read it to myself sort of outloud...and I do that with programs, too, even when I write programs. When the program starts to get too large and I have to jump back and forth from screen to screen or use the scroll bar, I find myself getting confused and mixed up, and I get a print out on it and I put the print-out on my desk and I like to see the whole thing. I'll even take the pages apart and spread it out on my desk so I can see four or five pages of it.

Another reason he chooses to use paper is for the feedback it provides: "The printout tells me I've written four pages and I'm on my way. I guess it's just--I guess when you type something in a typewriter and you're cranking out these pages and this stack over here is getting higher and higher, you feel like you're getting something done. But when all you see is one screenful and it's full of text and it was full of text an hour ago, well, you like to see exactly how much you've gotten done." Reviewing with hard copy seemed to occur when Johnny had finished a section, or as he put it, "reached a goal in my outline." For Johnny, the use of hard copy may be particularly useful for setting and monitoring his writing goals.

One of the most intriguing factors influencing Johnny's decision to use word processing or to

use paper is the kind of task he is doing. Johnny sees a real distinction between the writing he does at work--much of it well-rehearsed procedural instructions--and the writing he does for his graduate classes, which usually requires persuasive arguments about somewhat unfamiliar issues. He describes the two different writing tasks this way:

> The stuff at work I already know and I'm just putting it on paper for someone else's benefit, in most cases. The papers that I have to write [for class], I don't know--I don't know what I'm going to write. I don't know what the results are. Sometimes I don't even know what's being asked for. So in that case I spend a lot more time reading the problem case, thinking to myself, what is he asking for. And then, you know, deciding what I'm going to try to find out. The two papers that I had write this summer for class were papers where I had to gather some research and I had to make some kind of hypothesis and gather research to try to prove or disprove it.

And there seem to be real differences in the way Johnny uses the tools available to him to perform these different kinds of writing tasks. These differences were most evident in his use of pen and paper for note taking, outlining, or drafting. For much of his writing at work--"stuff he already knows and is just putting on paper for someone else's benefit"--he generally composes directly on the screen without much preliminary note-taking. However, for the texts he writes for his graduate classes, he uses pen and paper much more extensively. For these more complex tasks, he often takes notes on paper, groups similar ideas together with brackets or other graphic marks, spends some time rereading and rearranging the groups of ideas, and finally jots down phrases or sentences to use in the text. Only at this point does he move to the computer to begin drafting.

Johnny contrasts the use of different tools for different tasks this way:

> I think that when I do stuff for work I have a similar kind of outline but it's in my head, because I already know how to [perform the task at hand] so I have an outline in my head. And all I do is, if ..I would just use the outline I have in my head--well, first do this, then do that. And so I'm just transferring that outline in my head into a paper when I write something for work. When I write something for school I don't have an outline in my head, so I have to create an outline on paper, then transfer it to the screen.

Johnny, like Tim, sometimes makes the choice not to use word processing for writing, even though it is readily available to him. His decision seems to be influenced by some of the limitations of the technology and particularly by the kind of writing task he is performing.

Factors Influencing Decisions about Word Processing

The decisions of these two writers suggest the rich interplay of factors influencing writers' choices about writing tools. These writers chose to use word processing for many reasons, including neatness and efficiency, the convenience of making changes, and the many formatting options made available by the computer system they used.

There are other factors that led Tim and Johnny to their decision *not* to use word processing. Sometimes there are limitations in computer technology that paper helps writers to overcome. For instance, Johnny used paper to supplement computer writing when he needed to see more information than was available on the screen. Tim sometimes found the computer "cold" or alternately, "distracting." Access may have had some influence on these writer's decisions; for other writers I've talked to this has been more of an issue.

These writers seemed to feel that some of their own goals--for organization, for convincing arguments, or as Tim said, "better papers"--were aided if they did some part of their writing on paper. A strong factor influencing writers' choices to use pen and paper rather than machine seems to be the task they are doing: Tim finds the computer more conducive to tasks "where the ideas come flowing out;" for tasks which require careful structuring of arguments and "objectivity" he prefers pen and paper, at least initially. Johnny, too, uses different tools for different tasks. For well-rehearsed tasks--where as he says, the outline is already in his head, the computer is an ideal tool: it is efficient, fast, and convenient. However, for tasks in which he "doesn't know what he wants to prove" he often chooses to use pen and paper, at least for notes or initial writing.

Further, the decision to use computers for writing is not one decision. For these two writers, at least, the choice to use or not use word processing is made again and again as new writing tasks are undertaken. The decision to use word processing or to use pen and paper may even be made several times in the course of completing a writing task. For Tim and Johnny, as well

as for other writers I have observed, there seem to be two major decision points in the writing process: writers may choose not to use the computer during initial planning or notetaking and/or during reviewing or rereading of the text. The composing process model developed by John R. Hayes and Linda Flower (1980) allows us to see clearly where these writers decided to use pen and paper when writing with computers: during planning and during evaluating, a subprocess of reviewing. Bridwell-Bowles et al.'s (1987) experienced writers, too, identified these two problem areas: they like using pen and paper for initial notetaking and planning, and they used hard copy to "judge and perfect" the text. It seems that at these junctures in the process--planning and reviewing--word processing may sometimes fall short.

There are many reasons--many good reasons--why writers may continue to use pen and paper or hard copy printouts even as they use word-processing. It is important to recognize the factors which lead people to continue to rely on pen and paper and hard copy printouts. First, we should insist, as consumers of this writing technology, that it meets our needs. A systematic assessment of how computer writers use pen and paper will help us determine how word processing does--and does not--meet the needs of writers. Second, as teachers, we need to explore the writing contexts and the writing tasks to which computer technology is best suited in order to help our students make wise choices about how, and when, they use word processing or computers for writing. And third, the research questions suggested by writers' decisions to use pen and paper and word processing can tell us more about the kinds of computer technology we need for writing, more about the relative strengths and weaknesses of these two writing technologies, and more about the process of writing itself.

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